Before the FEDERAL COMMUNICATIONS COMMISSION Washington, D.C. 20554

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In the Matter

Advanced Television Systems and Their Impact on the Existing Television Broadcast Service

Review of Technical and Operational Requirements: Part 73-E, Television Broadcast Stations

Reevaluation of the UHF Television Channel and Distance Separation Requirements of Part 73 of the Commission's Rules Federal Communications Commission Office of the Secretary

MM Docket No. 87-268

SUMMARY OF
COMMENTS
OF
NATIONAL BROADCASTING COMPANY, INC.

NBC has participated in this proceeding since its inception and has actively served in all areas on the Commission's Advisory Committee on Advanced Television Systems. In the main, NBC supports the Commission's tentative findings in the Notice. We are particularly encouraged that the Commission recognizes the importance to the public of participation by terrestrial broadcasters in ATV. We agree that it is important that existing NTSC receivers not be instantly made obsolete by the introduction of an incompatible ATV system.

It has been and continues to be NBC's position that an NTSC-compatible ATV system that can be implemented using every existing broadcaster's 6-MHz channel presents the fastest, most cost-effective way of bringing ATV to American consumers. Ultimately, additional spectrum likely will be needed to provide improved ATV service as technology advances. Nevertheless, the many technical and scientific, legal and regulatory, and administrative and practical tasks associated with reaching that goal will take an extensive period, on the order of a decade. In the meantime, a 6-MHz, NTSC-compatible ATV system can be implemented in the comparatively near future, while these other tasks are proceeding.

This kind of evolutionary approach to ATV development will preserve receiver compatibility at each transition. Thus, consumers need not make needless, short-term expenditures to receive state-of-the-art enhanced television service; rather, they can either enjoy technological advances as they occur or maintain their existing receivers, as they choose.

NBC agrees that it will be simpler and take less time if spectrum from the present VHF and UHF bands were used for ATV broadcasting, as opposed to spectrum not now allocated to broadcast uses. However, we believe that even reallocation within VHF and UHF still will be a very complex and lengthy process, whether or not the current spectrum assignments are repacked. Moreover, given that it appears that there will not be sufficient VHF and UHF spectrum to provide all existing broadcasters with additional spectrum allotments, the Commission should not be too hasty to rule out other bands for ATV, should the need arise. At a minimum, the Commission should keep in abeyance any additional plans for broadcast sharing with nonbroadcast uses until more data emerge regarding the spectrum needs of ATV.

Furthermore, we are concerned about the adequacy to accommodate ATV of the spectrum currently used for auxiliary broadcasting, particularly as this spectrum is shared with other services, in many instances. The Commission should consider freezing, or at the very least monitoring carefully, current assignment of this spectrum, as well as giving serious study to other spectrum that could be used for auxiliary purposes in connection with both broadcast and cable ATV transmission.

Finally, in light of the very real concerns about spectrum availability and the present importance of NTSC compatibility, we support the Commission's tentative conclusion that systems requiring more than 6 MHz to transmit an incompatible ATV signal should not be authorized for ATV broadcast service.

NBC also believes that the Notice's position on cross-media ATV compatibility should be strengthened. Our concerns include consumer acceptance of ATV. We believe that it is unlikely that ATV will receive widespread public acceptance if it is marketed in the form of different, incompatible systems for different media, on each of which the software, or programming, will necessarily be limited. This is an expensive result that will give rise to consumer confusion and, in all likelihood, consumer disinterest. Indeed, if the program diversity available via any given ATV system does not reach a "critical mass," its acceptance is unlikely. Therefore, we urge the Commission to actively encourage such compatibility.

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COMMENTS OF NATIONAL BROADCASTING COMPANY, INC.

National Broadcasting Company, Inc. (NBC) files the following comments in response to the Commission's Tentative Decision and Further Notice of Inquiry (Notice) in the above-referenced proceeding.

I. INTRODUCTION

NBC has participated in this proceeding since its inception and has actively served in all areas on the Advisory Committee on Advanced Television Systems (ACATS). We submitted comments on the draft Interim Report, and these comments were considered in the final version of the

Interim Report. Moreover, we have been working with the David Sarnoff Research Center (Sarnoff) on the development of ACTV, an NTSC-compatible advanced television system that was described in detail in NBC's and Sarnoff's previous comments in this docket. ACTV I is a 6-MHz compatible system that could be implemented by every broadcast licensee in its present channel. ACTV II is also a compatible system that would use additional bandwith and therefore provide even greater resolution.

II. TENTATIVE FINDINGS

In the main, we support the Commission's tentative findings in the Notice. We are particularly encouraged that the Commission recognizes the importance to the public of participation by terrestrial broadcasters in ATV. We agree that it is important that existing NTSC receivers not be instantly made obsolete by the introduction of an incompatible ATV system.

It has been and continues to be NBC's position that an NTSC-compatible ATV system that can be implemented using every existing broadcaster's 6-MHz channel presents the fastest, most cost-effective way of bringing ATV to American consumers. We believe that solutions requiring allotment of additional spectrum, even within the present VHF and UHF bands already allocated to TV broadcasting,

will take considerable time to implement. Ultimately, additional spectrum likely will be needed to provide improved ATV service as technology advances. Nevertheless, the many technical and scientific, legal and regulatory, and administrative and practical tasks associated with reaching that goal will take an extensive period, on the order of a decade. In the meantime, a 6-MHz, NTSC-compatible ATV system can be implemented in the comparatively near future, while these other tasks are proceeding.

This kind of evolutionary approach to ATV development will preserve receiver compatibility at each transition.

Thus, consumers need not make needless, short-term expenditures to receive state-of-the-art enhanced television service; rather, they can either enjoy technological advances as they occur or maintain their existing receivers, as they choose.

With respect to additional spectrum for ATV transmission, we agree that it will be simpler and take less time if spectrum from the present VHF and UHF bands were used for ATV broadcasting, as opposed to spectrum not now allocated to broadcast uses. However, we believe that even reallocation within VHF and UHF still will be a very complex and lengthy process, whether or not the current spectrum assignments are repacked.

Given that it appears that there will not be sufficient VHF and UHF spectrum to provide all existing broadcasters with additional spectrum allotments, the Commission should not be too hasty to rule out other bands for ATV, should the need arise. At a minimum, the Commission should keep in abeyance any additional plans for broadcast sharing with nonbroadcast uses until more data emerge regarding the spectrum needs of ATV.

Furthermore, we have grave concerns about the adequacy of the spectrum currently used for auxiliary broadcasting to accommodate ATV, particularly as this spectrum is shared with other services in many instances. The Commission should consider freezing, or at the very least monitoring carefully, current assignment of this spectrum, as well as giving serious study to other spectrum that could be used for auxiliary purposes in connection with both broadcast and cable ATV transmission.

Finally, in light of the very real concerns about spectrum availability and the present importance of NTSC compatibility, we support the Commission's tentative conclusion that systems requiring more than 6 MHz to transmit an incompatible ATV signal should not be authorized for ATV broadcast service.

While we agree in principle that ATV implementation in other services or nonbroadcast media should not be hindered, NBC believes that the Notice's position on cross-media ATV compatibility should be strengthened. concerns include consumer acceptance of ATV. We believe that it is unlikely that ATV will receive widespread public acceptance if it is marketed in the form of different, incompatible systems for different media, on each of which the software, or programming, will necessarily be limited. This is an expensive result that will give rise to consumer confusion and, in all likelihood, consumer disinterest. Indeed, if the program diversity available via any given ATV system does not reach a "critical mass," its acceptance is unlikely. Therefore, we urge the Commission not merely to be "sensitive to the benefits of compatibility" (Notice, paragraph 4) in ATV equipment across different media, but to actively encourage such compatibility to the extent of the limits of the Commission's abilities to act in this area.

III. SPECTRUM ISSUES

A. 6-MHz NTSC-Compatible Solution.

The Commission is right, to prefer "ATV systems that can provide service using the least spectrum" (Notice, paragraph 82), both on account of the practical problems

associated with using additional spectrum for ATV and the opportunity costs of assigning additional spectrum to that NBC further agrees with the Commission that a 6-MHz, NTSC-compatible system will have "only a relatively small economic impact on broadcasters, cable operators and consumers." Notice, paragraph 84. Also, because "the transition to ATV might occur more rapidly than otherwise if a 6-MHz NTSC compatible ATV transmission option were implemented" (Notice, paragraph 85), increased consumer demand for ATV sooner will benefit receiver manufacturers, and they will be able to reduce receiver prices sooner, as consumer demand escalates. Another advantage of a 6-MHz NTSC-compatible solution is that it will assure that the station's ATV coverage area should remain about the same size as its NTSC coverage area, a result that is not as clear for either spectrum augmentation or simulcast ATV systems, in which the ATV signal may not reach as far as the NTSC signal.

The primary objection raised to the 6-MHz compatible solution has been that 6-MHz, NTSC-compatible systems might not provide the level of image quality that ATV systems using greater bandwidth, or incompatible systems, will provide. At the state of ATV development in this country and elsewhere today, this concern may be unfounded. Given that television screen sizes are not expected to increase greatly for the next decade, we believe that the quality of

ACTV-I will be indistinguishable to the viewer from other ATV systems that may be marketed during this time period. */

At a minimum, such conclusions about the level of performance required should be held in abeyance until the Advisory Committee's system testing process has been completed. While it is somewhat frustrating to those who hope for the immediate implementation of ATV, system testing, if it is to be thorough and reliable, will inevitably be a lengthy process. This is the only way to determine whether and how well the proposed ATV systems actually will work, and only on this basis is it reasonable to expect the huge expenditures involved in ATV implementation to be made. It makes little sense to undertake spectrum assignment decisions until system testing has proven that theoretical assumptions work in practice. If a particular proposal does not prove out, there may be no need to entertain certain spectrum allocation configurations that otherwise would be warranted.

^{*/} Within this decade, various developmental efforts, including large-screen receiver development, work on display technology and the allocation of additional spectrum, can proceed simultaneously, after which ACTV-II, a system that provides even greater resolution, should be commercially viable.

In any case, the ACTV-I 6-MHz solution will afford the distinct advantage of being implementable before additional spectrum can be provided, for it will not require additional spectrum, provision of which, as the Commission recognizes, "may be complex and costly" (Notice, paragraph 88). It will also afford a gradual transition to ACTV-II, NTSC-compatible system using additional spectrum that would provide greater quality enhancement. In light of the time it will take to locate and assign additional spectrum, even within VHF and UHF, it seems to us that an evolutionary, fully-compatible transition to ATV may be the only realistic and cost-effective solution for broadcasters, equipment manufacturers, other media and, most importantly, the public.

There is another technological issue that is not strictly spectrum-related but that will have an impact on the timing of ATV's requirments for spectrum-receiver display technology. It is anticipated that it will take five-to-ten years to develop a reasonably-priced, large-screen receiver display with sufficient brightness that can take advantage of the enhanced resolution that additional spectrum can yield. Thus, all the many tasks associated with spectrum reallocation can take place without delaying the introduction of the HDTV, at the same time as display technology is being improved; during this

period, a 6 MHz, NTSC-compatible ATV system like ACTV-I can deliver the signal enhancement that present and near-term display technology is capable of delivering to viewers.

The ACTV-I/ACTV-II transition scenario offers a design for moving forward to ATV/HDTV in simple, cost-efficient stages that will enable each broadcast licensee to choose how to best serve its public.

B. 3- and 6-MHz Supplemental Spectrum Authorizations.

Availability of Spectrum.

The Notice cites spectrum analyses by Planning
Subcommittee Working Party 3 and by OET that make broad but
as-yet untested assumptions about the need for maintaining
all or some of the present UHF taboos. It is particularly
important that this work receive further exploration in
light of the OET Receiver Study, which indicates that the
existing receiver population may not withstand elimination
of certain taboo channels. On the basis of their extremely
generous assumptions, the spectrum studies conclude that
3-MHz augmentation channels may be available for many
stations in many markets, but not all stations,
particularly in the larger markets. Six-MHz channels, for
augmentation or simulcast, would be available in fewer
instances.

Not only are the legal ramifications of additional assignments under these circumstances uncertain, as we discuss below, but the conditions that ATV systems (1) not be susceptible to UHF taboo interference and (2) not cause interference to NTSC transmissions may be difficult to meet, especially given that today's receiver population includes many sets that are nowhere near the "state of the art." Further scientific modeling and laboratory studies must be conducted regarding UHF taboo elimination, the implications of which were not taken into account at all in the OET studies. In particular, the Zenith proposal, which indicates an intent to use some of the taboo channels for suppressed carrier signals, has raised many new questions. This method of spectrum utilization may well have merit, but it would be premature to reach a conclusion until considerable additional experimentation has taken place.

In sum, the analyses of Working Party 3 and OET should be regarded as a promising starting point for further study. However, there is too much at stake to alter, based only upon preliminary computer studies, the course of a multi-billion dollar industry. The programs used have not yet been optimized for this particular application. A computer program that can take into account a greater number of variable factors may be needed to provide a more accurate representation of cities, corridor effects, and terrain shielding factors, including multipath effects.

There is a high probability that ATV receivers may permit elimination of many of the current taboo restrictions. But laboratory studies and possibly field tests must be conducted, as well as theoretical analyses, to gain an understanding of the full implications of taboo The as yet untested Zenith proposal promises elimination. that certain taboo channels may be used at suppressed carrier signal levels: This implies that, for the lifetime of all existing and future NTSC receivers, augmentation or simulcast use of the taboo channels would have to be restricted to very low powers, so as not to affect NTSC receivers. What is not yet established is whether this would limit ATV signal strength in such a way as to provide significantly reduced ATV coverage areas as compared to The assumption of minimum separation distances and signal strengths of the OET studies could yield reduced ATV coverage areas; this possibility of reduced ATV coverage areas is another factor that persuades us that further analysis is necessary before spectrum decisions are made.

Certainly, in light of the many unproven hypotheses of these spectrum studies, it would be unwise to finalize spectrum allocation decisions now. Indeed, very real questions exist regarding whether noncontiguous augmentation channels will work to produce an acceptable signal. A contiguous augmentation channel may be more desirable than a noncontiguous one, although this solution

may not be possible everywhere in the country. Propagation differences between the two noncontiguous frequencies will require additional processors, plus an extra tuner and complete RF system. There also will have to be antenna development. While we believe that noncontiguous augmentation may be possible, it will require much study in RF propagation, reception and signal decodability. Indeed, it is not known yet whether it would be better or worse for a noncontiguous augmentation channel to be in the same or a different band (i.e., VHF/VHF, UHF/UHF or VHF/UHF) from the main channel signal.

Thus, while additional spectrum allocations in VHF and UHF may ultimately be desirable for ATV service at such time as developments in receiver technology and design warrant this, there exist many questions in this regard today. Some of these cannot realistically be answered absent system testing and propagation testing, not to mention existing receiver analysis. Under these circumstances, the early decisions concerning allocation of additional spectrum may turn out to be a meaningless exercise, if the spectrum in the configurations allocated cannot be used for ATV on account of technical or propagation problems that may not have been anticipated, given the current state of ATV development. The better course would be to encourage early implementation of a

6-MHz, NTSC-compatible ATV system, while all the spectrum and propagation studies continue with an eye to further transition to ATV using greater bandwidth.

2. Simulcast v. Augmentation.

Many of the spectrum issues can be addressed without specification of whether additional spectrum is to be used for simulcast or augmentation purposes. However, there are some distinctions that should be made. Six additional MHz will be required for simulcasting, not just the 3 MHz that might be possible with augmentation, which, in turn, means that fewer existing licensees will receive additional allotments. Also among the many questions regarding the simulcast option is whether any 6-MHz stand-alone ATV system, whether NTSC-compatible or not, ultimately will approach the quality of ATV systems using greater bandwidth. Preliminary work is inconclusive, although it would be premature to rule out the simulcast option on the basis of work to date.

Furthermore, it is not at all clear that many broadcast stations will be financially able to design, test build and operate ATV simulcasting facilities. Among other things, transmission facilities would immediately have to

be doubled and personnel increased, with little prospect of additional revenues in the foreseeable future. Moreover, existing NTSC program material would have to be converted.

C. Auxiliary Services.

It is our preliminary view that the existing auxiliary bands may not be able to support ATV transmission using greater than 6-MHz bandwidth, particularly taking into account cable's use of the same bands. As much of the broadcast auxiliary spectrum is assigned on a shared basis to various services, including private radio services, it may be prudent to discontinue such sharing now and to freeze future assignments until ATV's needs of this scarce spectrum are ascertained and a plan for meeting those needs has been developed. ATV will have many auxiliary spectrum implications beyond terrestrial broadcasters alone. Cable and common carriers must be considered, as well. example, there are over 19,000 CARS licensees in the already highly-saturated CARS bands, which are shared by services in Parts 21, 25, 74, 94 and 95 $\frac{*}{}$ of the Commission's rules. The importance of maintaining adequate auxiliary spectrum for ATV cannot be stressed enough, for without it there can be no ATV transmissions.

^{*/ 31} GHz only.

At paragraph 95 of the Notice, the Commission requested comment on the availability of spectrum for ATV broadcasting. NBC agrees with the Commission that propagational characteristics of the three frequency bands identified (4.4 - 4.40 GHz, 7.75 - 7.9 GHz and 12 - 12.7GHz) make them unsuitable for ATV primary broadcast use or for augmentation ATV broadcasting to the home, but we believe that these three bands should be considered for nonbroadcast (i.e., auxiliary) ATV use. propagational characteristics today do not deter broadcasters from using nearby bands with similar characteristics for broadcast support services. services include all video transport services other than VHF (channels 2 - 13) and UHF (channels 14 - 69). These video transport services provide signals to the studio as well as transmission paths from the studio to viewers.

The use of the three identified bands could assure a smoother transition to terrestrial ATV signals using greater than 3 MHz of spectrum, particularly considering that NTSC service is to be maintained, as well. Indeed, as the transition to ATV using wider bandwidth channels progresses, cable systems, relying now on the CARS bands for relay servcies, also will require more spectrum for auxiliary use.

The 4-GHz band, from 4.9 to 4.99 GHz, is domestically allocated for government fixed and mobile services.

According to the Commission, there are approximately 1,300 assignments currently on this band. Temporary sharing of this band may be possible, because power levels for broadcast use would be low and it would be used only as a point-to-point service.

The 7-GHz band is allocated to a government fixed service. There are approximately 1,000 assignments throughout the United States, some of them serving vital government functions. However, because this is a fixed service, safe, coordinated sharing is potentially possible. Broadcasters, as well as other RF spectrum users, have considerable experience in sharing channels in the same bands. The 13 GHz CARS band (12.7 - 13.2 GHz) for example, is shared by services using both 6-MHz and 36-MHz channels, with the wider channels often used for mobile service.

The 12.2 - 12.7 GHz band, reserved for DBS, also appears to have the potential to be shared by ATV broadcast support services on a secondary basis, without interfering with the primary use for which the band is intended.

Another possible solution to the auxiliary spectrum dilemma would be to assign a microwave band exclusively for ATV distribution, rather than sharing microwave spectrum with other existing users. Considering coverage distances, propagation effects and equipment required, the spectrum just above 2.5 GHz might be workable for this purpose. At any rate, a new band should be reserved for ATV auxiliary use before more of this spectrum is occupied for other uses.

IV. STANDARDS

A. NTSC Transmission Standard.

We are generally in accord with the Commission's conclusion that the NTSC standard should not be relaxed or eliminated now, but that waiver requests for ATV transmissions should be entertained, subject to the criteria set out in paragraph 109 of the Notice.

B. The Commission Should Set An ATV Transmission Standard That Is Acceptable to the Industry.

We agree that the Commission should, with industry guidance, set an ATV transmission standard. A governmentally-sanctioned standard is necessary to assure that the ATV service provided to the public is the best possible, given the current state of technology. A single standard also is necessary to ensure prompt market

penetration and avoid consumer confusion among competing systems. It will disserve the industry and the public alike if there is not a single ATV standard.

We also agree that it would be premature to set this standard until the Advisory Committee's testing of proposed systems has been completed and evaluated and other aspects of its technical work have progressed; nevertheless, the field of proponents should continue to be focused by the Commission's establishment of realistic, practical for ATV service in the public interest, just as the Commission has done with its Tentative Findings in this Inquiry. In light of the cooperative effort exhibited by all segments of the industry throughout the Advisory Committee effort to date, it can be expected that the Advisory Committee's work will continue to have value to the Commission, the industry and the public.

Mhile it is possible that there would develop a defacto ATV standard without Commission action, it is unlikely that such a standard would emerge as soon as if the Commission set one. Moreover, it is probable that several different systems would reach market, with some not proving viable, before a defacto standard was established. This would clearly disserve consumers and the industry alike and impede ATV penetration altogether.

The standard established by the Commission mandatory, and it should encompass an entire ATV transmission system, including the receiver. Only under conditions of such certainty can the Commission ensure that the public will receive quality ATV service, and only under such conditions can ATV be expected to receive widespread consumer acceptance. There is no reason to limit the duration of any ATV standard established, so long as it allows for flexibility to incorporate future technological improvements, as the NTSC standard has done. Moreover, the standards-setting process is such that, should truly revolutionary developments in ATV transmission occur, whatever standard is adopted now can be modified on the basis of a consensus that such modification is warranted.

NBC has misgivings about an open architecture receiver approach, concerning both the expense and reliability of the receiver itself. It is unlikely that such receivers could be manufactured at a price consumers would be willing to pay. Moreover, until this concept is fully tested, its reliability cannot be known.

C. NTSC Compatibility.

As the Commission recognizes, acceptable service to the existing NTSC receiver population must be maintained even as we undergo transition to ATV. Just as the public would be disserved by the confusion and dislocation that inevitably would be caused by the Commission's failure to specify a single ATV standard, so would it suffer should the Commission fail to require continued NTSC service.

It is likely that the industry would continue to serve NTSC receivers without the Commission's requiring it.

Nevertheless, this proposition is so important as to warrant a requirement, at least for a period of time, <u>i.e.</u>, while substantial numbers of NTSC receivers are in the marketplace.

It should not be necessary to specify a particular quality level of NTSC picture for compatible ATV systems. So long as NTSC compatibility is required, the systems testing process of the Advisory Committee should take this into account and it should be considered in the Commission's ATV standard-setting process. However, to whatever extent the Commission involves itself in NTSC quality standards, this involvement should continue so long as NTSC receivers are in the marketplace.

Consumers should not have to purchase and install ATV-to-NTSC converters to continue to receive NTSC signals, whatever the cost. It simply is not acceptable to effectively disenfranchise those who reasonably relied on a marketplace offering NTSC receivers because an improved but

incompatible TV technology is introduced. This would be particularly unwise public policy because it would disadvantage those economically less able to cope with the potential dislocation and to purchase ATV converters. It is not in the public interest for ATV to become a service largely for the economically advantaged. This would undermine the unique, virtually universally-available, free over-the-air system of broadcasting in this country.

We are also concerned in this regard about the simulcast solution. Should a broadcaster choose to vary the ATV from the NTSC programming on a simulcast system, those consumers without ATV reception capability may similarly be disadvantaged. This would be particularly true if ATV were used to deliver the more visually-attractive or "premium" programming, with that remaining left to NTSC transmission.

D. Compatibility With Other Video Media.

Ideally, the marketplace should provide cross-media
ATV compatibility. Just as it is essential to consumer
acceptance of ATV that a single ATV broadcast transmission
standard be adopted, it is important that all video media
use the same or compatible ATV systems. Consumers will not
be eager to purchase an ATV system on which they can
receive only some programming, or to purchase different ATV